

Lepidoptera Pupae



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Types of Insect Pupae

- Exarate - appendages free, functional mandibles present (Decticous) or absent (Adecticous)
- Coleoptera, basal Lepidoptera, higher Diptera (exarate pupae enclosed in puparium)



Coleoptera



Diptera

Alex Wild

North American Lepidoptera with Exarate and Decticous Pupae

- Micropterigidae
- Eriocraniidae
- Acanthopteroctetidae



Eriocraniidae

T. Harrison



Acanthopteroctetidae

D. Davis & P. Gentili

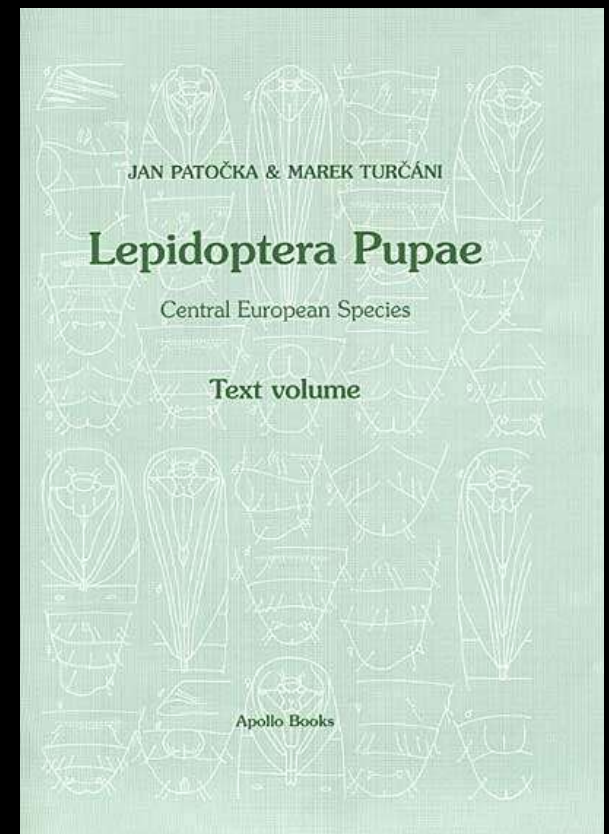
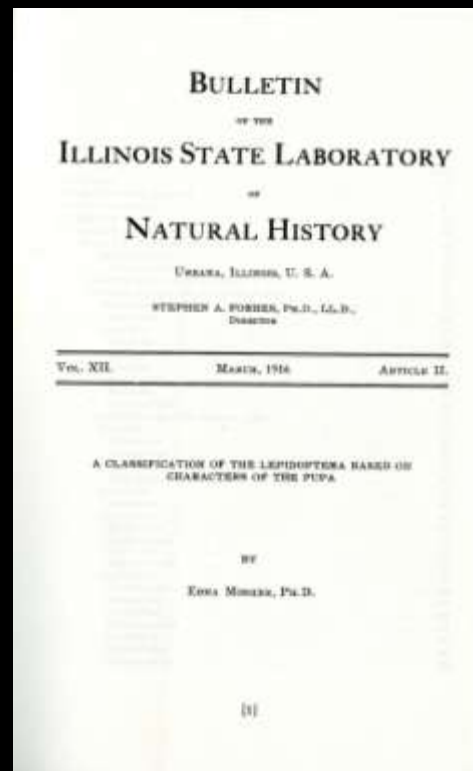
Types of Insect Pupae

- Obtect - appendages fused with body (most Lepidoptera, lower Diptera).
- Some lower grade families, e.g., Tineidae, Gracillariidae, Nepticulidae, and others with appendages weakly fused.



Major Works on Lepidoptera Pupae

- Edna Mosher, 1916
- Howard Hinton, 1946
- Jan Patočka & Mark Turčani, 2005



Pupae Incompletae

- less fusion of abdomen segments, more movable.



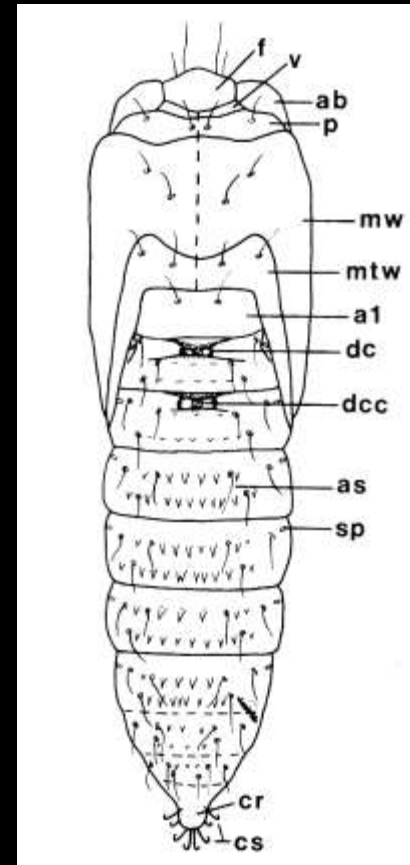
N.A. Martin

Pupae Incompletae

- push forward out of cocoon during emergence.
- abdominal tergites with spines to aid forward movement.



Podesia (Sesiidae) Whitney Cranshaw



Major groups with *Pupae Incompleta*

- Tineoidea
- Gracillarioidea
- Zygaenoidea
- Cossoidea
- Tortricidae
- Choreutoidea

Pupae Completa (= Obtectomera)

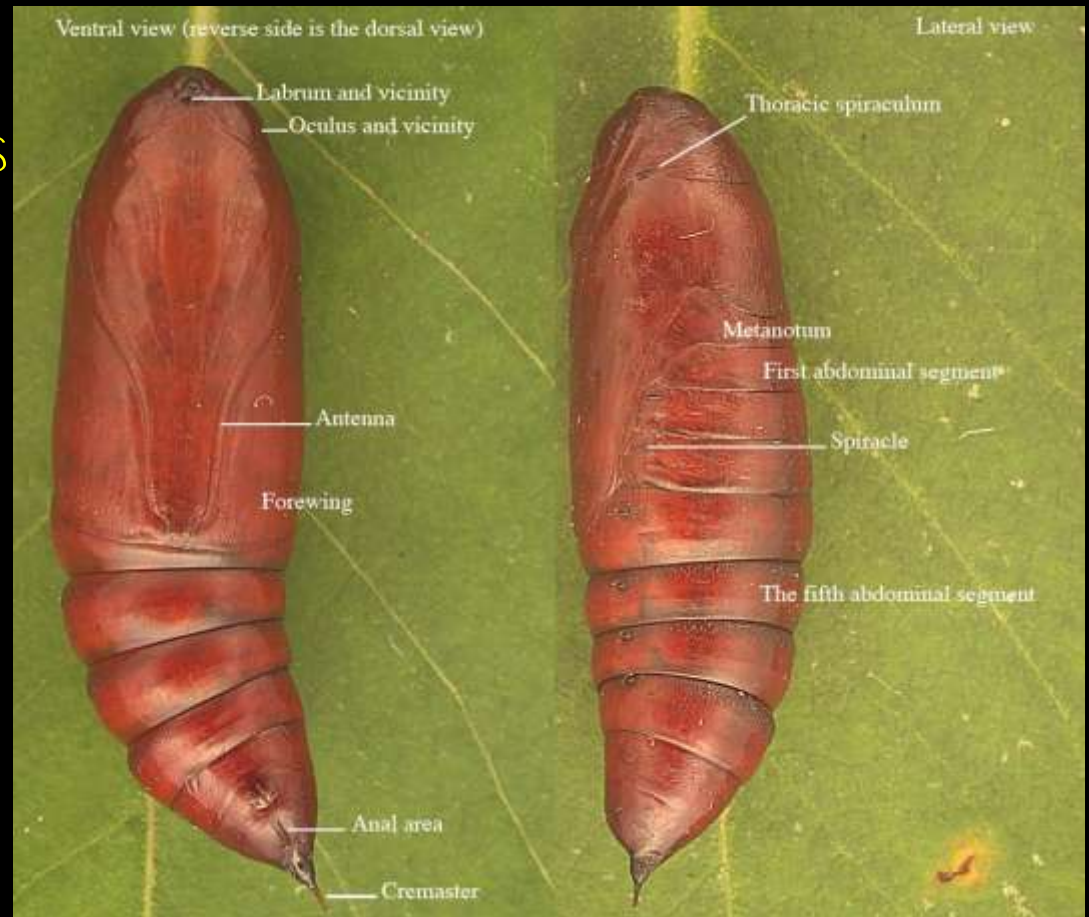
- Pupae with abdominal segments less movable.
- Spines on abdomen absent.
- Pupa not extruding from pupation site.

Major groups with *Pupae Completa*

- Yponomeutoidea
- Gelechioidea
- Pyraloidea
- Macrolepidoptera

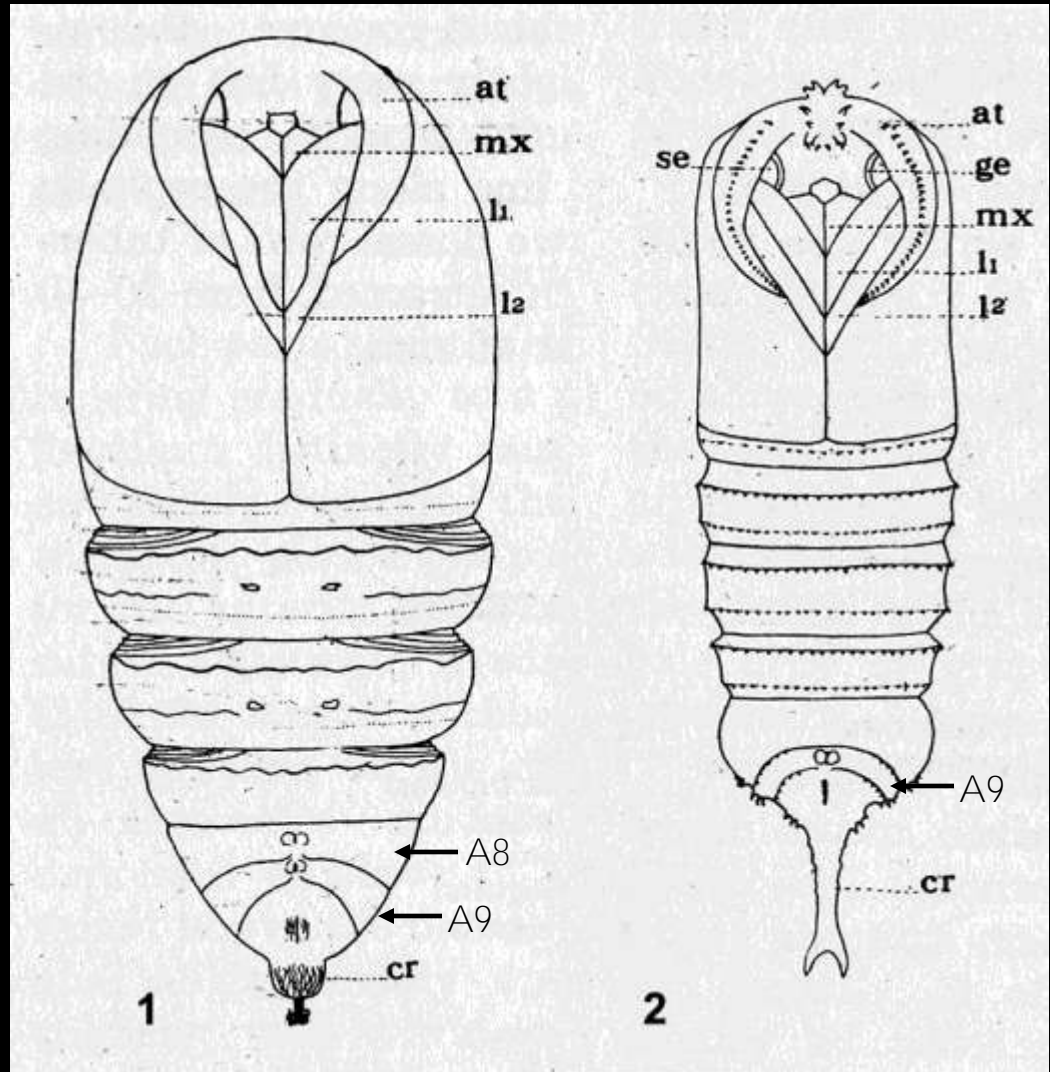
Pupal Structures

- Head, thoracic segments and appendages identifiable.
- Abdomen with ten segments.



Sexing Pupae

- A10 with anal slit
- Genital scars on A8 and A9 in female (may be undetectable on A9).
- Genital scars on A9 in male.



When is a pupa not a pupa?

- Molting involves two steps: apolysis (separation of old and new cuticles) and ecdysis (shedding of old cuticle).
- Apolysis without ecdysis results in pharate stages.



J. Staake

When is a pupa not a pupa?

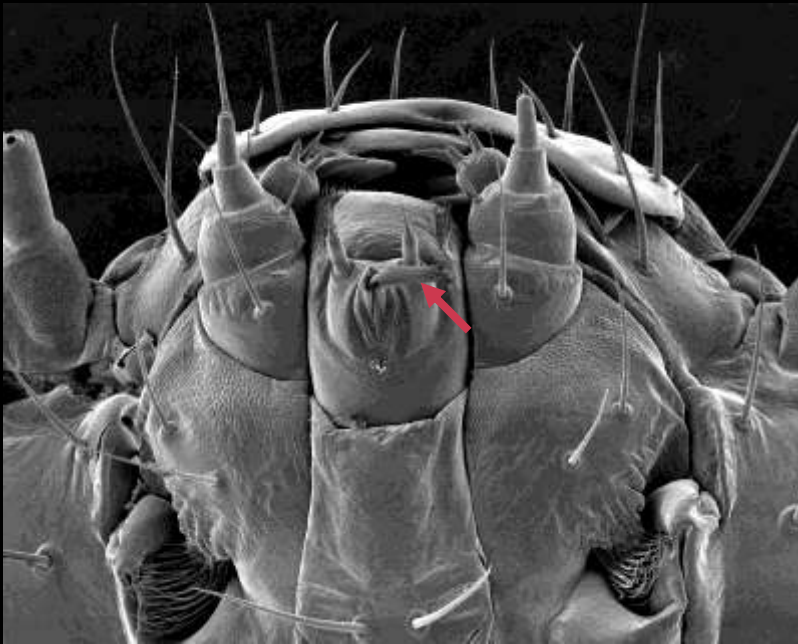
- Metamorphosis based on molting.
- Molting involves two steps: apolysis (separation of old and new cuticles) and ecdysis (shedding of old cuticle).
- Apolysis without ecdysis results in pharate stages.
- The Diptera puparium is a pharate pupa within the larval skin.
- Lepidoptera often have pharate pupae or pharate adults.



J. Staake

Cocoons

- Silk produced by larval labial glands and extruded by spinnerets.
- Labial glands with multiple functions, e.g. work of Gary Felton.



Cocoons

- Many species without cocoons, e.g., Papilionoidea, some Tortricidae.
- Many in soil cavities without cocoons, e.g., some Sphingidae, Notodontidae, and others.



Cocoons

- Variations in cocoons:
Ribbed cocoons: Buccalatricidae.



Terry Harrison, microleps.org

Cocoons

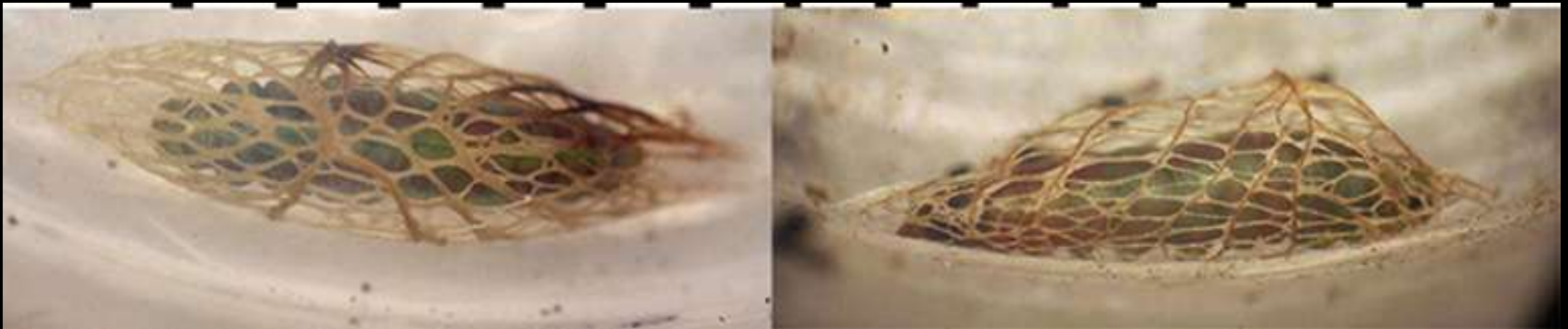
- Variations in cocoons:

Transparent, thin cocoons: e.g., Gracillariidae



Cocoons

- Variations in cocoons:
Lace-work cocoons: Acrolepiidae.



Terry Harrison, microleps.org

Cocoons

- Variations in cocoons:

- Single and double wall cocoons
 - with and without leaf coverings, e.g., Saturniidae.



Shay, Deviant Art



Cocoon Rattles



Summary

- Exarate and Obtect Pupae.
- Exarate pupae dectitious in basal families.
- Obtect pupae divided into Incompleta and Completa (Obtectomera).
- Silk cocoons present or absent with variations.